ME 597 - Sustainable Energy Options and Analysis
Fall 2016

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Office Hours: Tuesday and Thursday, 12:00 – 1:00 pm, ME 3003H

Teaching Assistant: TBD

Website: https://engineering.purdue.edu/ME597B/home.html

Textbook:

Additional Materials
Class Notes
Supplemental Handouts

Course Objectives:
Gain an understanding of the current energy situation and impacts of energy choices on economics and sustainability metrics
Gain an understanding of alternative technologies for meeting future energy needs
Learn how to assess the potential for alternative energy technologies in terms of economic and sustainability metrics
Gain experience in assessing different energy technologies

Prerequisites: thermodynamics, heat transfer, mathematics, calculus, and physics

Grading:
Homework 30%
Exams (2) 40%
Class Participation 5%
Project 25%

Software:
For some homework problems and the project, students are encouraged to use EES (Engineering Equation Solver). EES solves systems of non-linear equations and incorporates thermodynamic and transport property data for many common working fluids and materials. Life-Cycle Analysis (LCA) software tools may be needed for some homework and the class project.
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<th>Section</th>
<th>Topics</th>
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| 1 | Introduction  
- energy and energy conversions  
- overview of energy production and consumption  
- value of energy (cost, 1st and 2nd law efficiency)  
- environmental impacts of energy  
- sustainability  
- renewable energy options | Chap 1  
Class Notes  
EIA (2010) |
| 2 | Analyzing Options  
- Energy Economics  
- Life-Cycle Assessment (LCA) | Class Notes |
| 3 | Energy Storage and Distribution  
- connected efficiencies and energy chains  
- energy transmission and distribution  
- environmental impacts of distribution systems | Class Notes |
| 4 | End-Use Energy Sectors  
- electric power production  
- transportation  
- industrial  
- commercial and residential buildings | Class Notes |
| 5 | Fossil Fuels  
- resource base  
- harvesting energy products  
- environmental impacts  
- economics  
- CO₂ sequestration  
- Combined Cycle Power Generation  
- Combined Heat and Power (CHP) Systems  
- Fuel Cells | Class Notes  
Chap. 10, 11 |
| 6 | Nuclear Power  
- reactor technologies  
- economics  
- safety issues  
- fuel cycle and resources  
- fusion  
- future prospects | Class Notes  
Chap. 15 |
| 7 | Solar Energy  
- resource assessment  
- passive and active solar thermal  
- solar thermal electric  
- solar photovoltaic  
- economics  
- sustainability attributes  
- status and future potential | Class Notes  
Chap. 6, 7, 8 |
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<th>Section</th>
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| 8       | Wind Energy  
• wind resources  
• wind generating equipment and performance  
• economics  
• sustainability  
• status and future potential | Class Notes Chap. 4 |
| 9       | Geothermal Energy  
• geothermal resource options and potential  
• geothermal systems  
• sustainability attributes  
• status and future potential | Class Notes Chap. 13 |
| 10      | Oceanic Energy  
• energy from tides  
• energy from waves  
• energy from temperature differences  
• economic prospects  
• sustainability considerations  
• status and future potential | Class Notes Chap. 14 |
| 11      | Hydropower  
• resource assessment  
• energy conversion equipment  
• sustainability attributes  
• status and future potential | Class Notes Chap. 3 |
| 12      | Biomass Energy  
• biomass resource options and potential  
• biomass production  
• thermal conversion  
• environmental issues  
• economics  
• future prospects | Class Notes Chap. 12 |
| 13      | Student Project Presentations – Last 2 weeks of semester |